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LETTER TO THE EDITOR

The matrix representation of the operators acting in the Radcliffe space

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Abstract. The rule for constructing the matrix representation of operators expressed as functions of (S_+, S_-, S_z) is given.

We deal with the functions

$$\|\mu\rangle = (1+|\mu|^2)^{S}|\mu\rangle = \sum_{p=0}^{2S} {\binom{2S}{p}}^{1/2} \mu^{p}|p\rangle,$$
(1)

where $|\mu\rangle$ are the Radcliffe functions determining the spin coherent states. Let us choose any arbitrary set of complex numbers $\mu_0, \mu_1, \ldots, \mu_{2S}$ which satisfy the only restriction

$$\Delta = \begin{vmatrix} 1 & \mu_0 & \mu_0^2 & \cdots & \mu_0^{2S} \\ 1 & \mu_1 & \mu_1^2 & \cdots & \mu_1^{2S} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 1 & \mu_{2S} & \mu_{2S}^2 & \cdots & \mu_{2S}^{2S} \end{vmatrix} \neq 0.$$
(2)

We can substitute the new basis $\|\mu_0\rangle$, $\|\mu_1\rangle$, ..., $\|\mu_{2S}\rangle$ for the basis $|p\rangle$ in formula (1). As a consequence, the functions $\|\mu\rangle$ assume the form

$$\|\mu\rangle = \frac{1}{\Delta} \sum_{p=0}^{2S} \sum_{i=0}^{2S} \mu^{p} M_{ip} \|\mu_{i}\rangle,$$
(3)

where M_{ip} is a subdeterminant.

The matrix element related to any operator $\hat{\mathscr{G}}$ assumes the form

$$\langle \lambda \| \hat{\mathscr{G}} \| \mu \rangle = \sum_{p,q}^{2S} (\lambda^*)^q \mu^p A_{qp}, \tag{4}$$

where

$$A_{qp} = \frac{1}{|\Delta|^2} \sum_{ji}^{2S} M_{jq}^* \langle \mu_j \| \hat{\mathscr{G}} \| \mu_i \rangle M_{ip}$$

must be independent of any basis. The matrices A_{qp} may be recognized as the relevent operator representation.

It is easy to verify that this matrix representation obeys the following algebra:

$$A_{qp}^{12} = \sum_{r}^{2S} \frac{A_{qr}^{1} A_{rp}^{2}}{\binom{2S}{r}},$$
(5)

where A_{qp}^{12} is related to

$$\hat{\mathcal{G}}^{12} = \hat{\mathcal{G}}^1 \cdot \hat{\mathcal{G}}^2.$$

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